

REMARKS

In the last Office Action, the Examiner rejected claims 5-8 and 11-12 under 35 U.S.C. §112, second paragraph, for indefiniteness. Claims 1, 4, 5-8 and 10 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,104,123 to Okazaki et al. ("Okazaki"). Claims 1, 4, 5-9, 14 and 15 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,852,336 to Takagi. Claims 1-9 and 11-19 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,416,375 to Funakubo et al. ("Funakubo"). Claims 2 and 3 were objected to as being dependent upon a rejected base claim, but indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicants and applicants' counsel note with appreciation the indication of allowable subject matter concerning claims 2-3. However, for the reasons noted below, applicants respectfully submit that amended claims 1 and 4-19 and newly added claims 20-22 also patentably distinguish from the prior art of record.

In accordance with the present response, the specification has been suitably revised to correct informalities, provide antecedent basis for the claim language, and bring it into better conformance with U.S.

practice. The title of the invention has been changed to "PIEZOELECTRIC MOTOR AND STAGE AND ELECTRONIC APPARATUS EQUIPPED WITH PIEZOELECTRIC MOTOR" to more clearly reflect the invention to which the claims are directed. A new, more descriptive abstract has been substituted for the original abstract.

Allowable claims 2 and 3 have rewritten in independent form to incorporate the subject matter of base claim 1. Independent claim 1 has been amended to further patentably distinguish from the prior art of record. Claims 5-8, 11 and 12 have been amended to overcome the indefiniteness rejection raised by the Examiner. Claims 1-19 have also been amended in formal respects to improve the wording, conform to the amendments to base claim 1, avoid instances of indefiniteness, and bring them into better conformance with U.S. practice. New claims 21-22 have been added to provide a fuller scope of coverage.

In view of the foregoing amendments, applicants respectfully submit that the rejection of claims 5-8, 11 and 12 under 35 U.S.C. §112, second paragraph, has been overcome and should be withdrawn.

Applicants request reconsideration of their application in light of the following discussion.

Brief Summary of the Invention

The present invention is directed to a piezoelectric motor and to a stage and an electronic apparatus equipped with the piezoelectric motor.

As described in the specification (pgs. 1-2), conventional piezoelectric motors have been unable to realize high precision positioning or movement of a movable member. This is due to the fact that elastic and support members forming part of the piezoelectric motor are often deformed during operation of the piezoelectric motor.

The present invention overcomes the drawbacks of the conventional art. Figs. 1A-1D and 7A-11B show embodiments of piezoelectric motors according to the present invention embodied in the claims. The piezoelectric motor has a vibrating body 1 or 7 for undergoing vibrational movement in accordance with a vibration wave generated by, for example, a piezoelectric element disposed on the vibrating body. A contact member 5 is disposed in contact with and driven by the vibrating body 1 or 7 during vibration thereof. A support member (any of the support members designated with reference numerals 2, 22-24, 26, 29) supports the vibrating body 1 or 7 in the vicinity of a vibration node of the vibration wave. A pressurization mechanism (e.g., including spring member 11) applies pressure to the support member along a pressurization axis to maintain the vibrating body 1 or 7 in pressure contact

with the contact member 5 so that during vibration of the vibrating body, the support member regulates movement of the vibrating body in a direction of rotation about the pressurization axis.

In other aspects, the present invention is directed to a stage or to an electronic apparatus equipped with the piezoelectric motor according to any of the embodiments shown in the drawings.

By the foregoing construction, a piezoelectric motor having improved driving efficiency and stability is achieved as compared to the conventional art.

Traversal of Prior Art Rejections

Claims 1, 4, 5-8 and 10 were rejected under 35 U.S.C. §102(b) as being anticipated by Okazaki. Applicants respectfully traverse this rejection and submit that amended claims 1, 4, 5-8 and 10 recite subject matter which is not identically disclosed or described in Okazaki.

Amended independent claim 1 is directed to a piezoelectric motor and requires a vibrating body for undergoing vibrational movement in accordance with a vibration wave, a contact member disposed in contact with and driven by the vibrating body during vibration thereof, a support member for supporting the vibrating body in the vicinity of a vibration node of the vibration wave, and pressurization means

for applying pressure to the support member along a pressurization axis to maintain the vibrating body in pressure contact with the contact member so that during vibration of the vibrating body, the support member regulates movement of the vibrating body in a direction of rotation about the pressurization axis.

Applicants respectfully submit that Okazaki does not disclose or describe the structural combination, and corresponding functions, of the piezoelectric motor recited in amended independent claim 1.

Okazaki discloses a vibration actuator comprising a vibration member 10 having a vibrating body (i.e., elastic member) 11, a contact member 41 disposed in contact with the vibrating body 11 via friction members 14a, and a support member 33 for supporting the vibration member 10 to a base (Fig. 1C). The support member 33 has a positioning member 21 for positioning the vibrating body 11 relative to the contact member 41, and a pressing member 31 for applying a pressing force to the positioning member to press the vibrating body 11 into pressure contact with the contact member 41. The positioning member 21 is fit into a notch 11a which is disposed at a location of a node of longitudinal and bending vibrations. Thus, the sole functions of the positioning member 21 in Okazaki are to position the vibrating body 11 relative to the contact member 41 and, in conjunction with the

pressing member 31, press the vibrating body 11 into pressure contact with the contact member 41.

In contrast, amended independent claim 1 recites a support member for supporting the vibrating body in the vicinity of a vibration node of the vibration wave, and pressurization means for applying pressure to the support member along a pressurization axis to maintain the vibrating body in pressure contact with the contact member so that during vibration of the vibrating body, the support member regulates movement of the vibrating body in a direction of rotation about the pressurization axis. The positioning member 21 in Okazaki clearly does not function to regulate movement of the vibrating body 11 in any direction of rotation. Since Okazaki does not disclose or describe this functional feature recited in amended independent claim 1, there can be no anticipation by Okazaki of amended independent claim 1 under 35 U.S.C. §102(b). That is, since each and every limitation of amended independent claim 1 is not found in Okazaki, the reference do not anticipate the claimed invention. See In re Lange, 209 USPQ 288, 293 (CCPA 1981). Furthermore, Okazaki does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify Okazaki's vibration actuator to arrive at the claimed invention.

Claims 4, 5-8 and 10 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the reference at least in the same manner as claim 1.

In view of the foregoing, applicants respectfully request that the rejection of claims 1, 4, 5-8 and 10 under 35 U.S.C. §102(b) as being anticipated by Okazaki be withdrawn.

Claims 1, 4, 5-8, 9, 14 and 15 were rejected under 35 U.S.C. §102(b) as being anticipated by Takagi. Applicants respectfully traverse this rejection and submit that amended claims 1, 4, 5-8, 9, 14 and 15 recite subject matter which is not identically disclosed or described in Takagi.

Amended independent claim 1 is directed to a piezoelectric motor as set forth above for the rejection under 35 U.S.C. §102(b) based on Okazaki.

Takagi discloses a vibration actuator having a vibrating body 11, contact members 21-1, 21-2, a support member 24-1 connected to the vibrating body 11, and a pressure application member 25-1 for applying pressure to the support member 24-1 in a direction of a pressurization axis (i.e., along a longitudinal axis of the support member 24-1) to bring the vibrating body 11 into pressure contact with the contact members 21-1, 21-2 (Fig. 1A). The support member 24-1 is secured to a securing member 26 (column 4, lines 57-60).

Thus, like the positioning member 21 in Okazaki, the sole functions of the support member 24-1 in Takagi are to position the vibrating body 11 relative to the contact members 21-1, 21-2 and, in conjunction with the pressure application member 25-1, press the vibrating body 11 into pressure contact with the contact members 21-1, 21-2. Stated otherwise, the support member 24-1 in Takagi does not regulate movement of the vibrating body in a direction of rotation about the pressurization axis, as recited in amended independent claim 1. The inability of the support member 24-1 to regulate movement of the vibrating body 11 in any direction of rotation is evident from the fact that the support member 24-1 is secured to a securing member 26.

In the absence of the foregoing disclosure recited in amended independent claim 1, anticipation cannot be found. See, e.g., W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) ("Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration"); Continental Can Co. USA v. Monsanto Co., 20 USPQ2d 1746, 1748 (Fed. Cir. 1991) ("When more than one reference is required to establish unpatentability of the claimed invention anticipation under § 102 can not be found."); Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 221 USPQ 481, 485 (Fed. Cir. 1984) (emphasis added) ("Anticipation

requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim").

Stated otherwise, there must be no difference between the claimed invention and the reference disclosures, as viewed by a person of ordinary skill in the field of the invention. This standard is clearly not satisfied by Takagi for the reasons stated above. Furthermore, Takagi does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify the vibration actuator disclosed by Takagi to arrive at the claimed invention.

Claims 4, 5-8, 9, 14 and 15 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the reference at least in the same manner as claim 1.

In view of the foregoing, applicants respectfully request that the rejection of claims 1, 4, 5-8, 9, 14 and 15 under 35 U.S.C. §102(b) as being anticipated by Takagi be withdrawn.

Claims 1-4, 5-8, 9 and 11-19 were rejected under 35 U.S.C. §102(b) as being anticipated by Funakubo. Applicants respectfully traverse this rejection and submit that amended claims 1-4, 5-8, 9 and 11-19 recite subject matter which is not identically disclosed or described in Funakubo.

Amended independent claim 1 is directed to a piezoelectric motor as set forth above for the rejection under 35 U.S.C. §102(b) based on Okazaki.

Funakubo is directed to an ultrasonic motor having a vibrating body 11, a contact member 25 (slider), and pressure contact rollers 26 and springs 28 for pressing the contact member 25 into pressure contact with the vibrating body 11 in a direction of a pressurization axis which is a direction parallel to the longitudinal axes of support portions 22 (Fig. 2). The support portions 22 are provided on opposite sides of a central portion of an upper surface of a base 21 and are connected to projections 13 extending from opposite sides of the vibrating body 11.

Thus, the supporting function of the support portions 22 in Funakubo is only for the purpose of positioning the vibrating body 11 relative to the contact member 25 so that the contact member 25 is accurately brought into pressure contact with the vibrating body 11 during vibration thereof. There is absolutely no teaching or disclosure in Funakubo that the support portions regulate movement of the vibrating body in a direction of rotation about the pressurization axis, as recited in amended independent claim 1. Since Funakubo does not disclose or describe this functional feature recited in amended independent claim 1, there can be no anticipation by Funakubo of amended independent claim 1 under 35 U.S.C.

§102(b). Furthermore, Funakubo does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify Funakubo's ultrasonic motor to arrive at the claimed invention.

Claims 2-4, 5-8, 9 and 11-19 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the reference at least in the same manner as claim 1.

In view of the foregoing, applicants respectfully request that the rejection of claims 1-4, 5-8, 9 and 11-19 under 35 U.S.C. §102(b) as being anticipated by Funakubo be withdrawn.

Applicants respectfully submit that the prior art of record also does not disclose or suggest the subject matter recited in newly added claims 21-22.

New independent claim 21 is directed to a piezoelectric motor and requires a vibrating body having one of a plurality of concave portions and a plurality of convex portions, a piezoelectric element disposed on the vibrating body for generating a vibration wave to vibrate the vibrating body, a movable body disposed in contact with and driven by the vibrating body during vibration thereof, and a support member for supporting the vibrating body in the vicinity of a vibration node of the vibration wave, the support member having the other of a plurality of concave portions and a

plurality of convex portions engaging the corresponding
respective concave or convex portions of the vibrating body.
Claim 21 further requires pressurization means for applying
pressure to the support member to maintain the vibrating body
in pressure contact with the movable body to thereby move the
movable body during vibration of the vibrating body. As
recognized by the Examiner with respect to allowable claims 2
and 3, no corresponding structural and functional combination
is disclosed or suggested by the prior art of record.

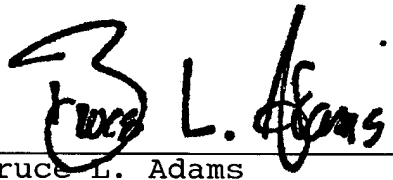
Claim 22 depends on and contains all of the
limitations of independent claim 21 and, therefore,
distinguishes from the prior art of record at least in the
same manner as claim 21.

In view of the foregoing amendments and discussion,
the application is believed to be in allowable form.
Accordingly, entry of this amendment and favorable
reconsideration and allowance of the claims are most
respectfully requested.

Respectfully submitted,

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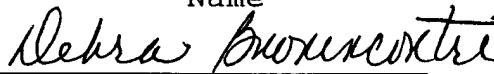
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